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ABSTRACT

The explosive technological advances of recent years have created a need to incorporate technical education into curricula at all levels from elementary through and including higher education. This in turn has led to the necessity of articulation among the various levels of technical education, including articulation between postsecondary institutions and higher education. Included among the current issues that are of particular importance for technical education in this country are strengthening the role of technical education in economic development, determining and developing the appropriate role of technical education in higher education in the United States, meeting the requirements for increased competency levels among technical education students, and funding the increased costs resulting from these increased requirements. Areas in which innovations can contribute to the success of technical education in meeting the need for a highly skilled work force in a technological society include (1) establishment of advisory committees to perform such functions as making curriculum recommendations, providing professional development opportunities for faculty and placement opportunities for students, arranging for equipment donations, and delivering guest lectures to students; (2) development of industrial/university linkages that address such areas as cooperative planning, curriculum evaluation, and instructional materials development; (3) use of part-time adjuncts/specialists; and (4) innovative delivery of courses through distance education. Three pages of references conclude the report. (MN)

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Technological Education in the United States: Present and Emerging Patterns

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Technological Education in the United States:
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Introduction

The explosive technological advances of recent years have created a need to incorporate technical education into curricula at all levels. This may take the form of career education and computer literacy in primary grades. Technical education in secondary schools has become increasingly more sophisticated, and provides the necessary background for highly advanced training offered by a variety of postsecondary institutions. In the United States, there is considerable support for developing procedures to facilitate articulation and transfer arrangements among high schools, community colleges, and universities.

A number of issues are involved in developing and promoting technical education. The role of education in economic development must be considered, due to the symbiotic relationship between education and employment. It is also necessary to assess the appropriate role of technical education in institutions of higher learning, such as universities. These institutions, which have traditionally addressed theoretical considerations, are now expanding their programs to offer sophisticated training in a number of higher technologies. Additional issues include increased requirements related to competency levels, funding the increased costs of technical education, and planning for the innovative delivery of courses.

A number of educational innovations have broadened the perspectives of technical education and enhanced the quality of its delivery. Advisory committees provide diverse services, evaluating programs and addressing rapidly changing concerns. Linkages between industrial and

educational sectors offer mutual advantages to students, business, and universities. The use of adjunct faculty and specialists from a variety of fields can offer valuable expertise to eager students. These and other developments currently offer the promise of an exciting and stimulating educational environment, one which becomes progressively more challenging with each technological innovation.

SECTION I: OVERVIEW

Elementary

Career education for elementary students has been increasing since the 1970s. Primary objectives for school curricula have included fostering positive attitudes toward work and promoting knowledge to assist students in making decisions related to career and professional choices.

The term career education was coined in 1971 by the Commissioner of the U.S. Office of Education. The degree of interest in the concept is evidenced by the fact that an Office of Career Education now exists within the U.S. Office of Education. Hoyt (1976) has averred that work "...is a human right, not a societal obligation" (p. 3). It is not surprising, then, that the nature of career education centers on the word 'work'.

Accordingly, necessary curricular changes must start in the elementary school. Career implications of subject matter must be emphasized, positive work and study habits developed, and the entire field of career development explored. This exploration should include areas of career awareness, career motivation, career decision making, career preparation, and career entry. Teachers need to focus on performance evaluation as a means of assessing student skills. In addition, curricula should include inviting resource persons into the classroom as well as providing observational opportunities, work experiences, and work-study activities.

As elementary schools explore ways to develop knowledge to prepare students in their eventual quest for a profession, the choice of a

career often starts with children's fantasies. They choose as role models those they want to emulate--Daddy at first, and then later the policeman and fireman, jobs children view as adventurous.

Traditionally, the field trip to the fire station or to the police station has been in the primary curriculum to satisfy students' curiosity, and to teach desirable skills and attitudes related to safety. Career education in the elementary school, however, has expanded breadth of careers to be examined. And career exploration affords a fine opportunity for developing attitudes that do away with stereotypes using sex as a determinant for particular jobs and a single race as a source for role models.

Students in the middle grades (four, five, and six) often participate in career days in which guest speakers are invited to the class to discuss their jobs that may range from airline pilot, funeral director, plumber, lawyer to truck driver. The choices usually are based upon the parents' occupations as teachers encourage parental participation, and on the willingness of workers in the community to appear on a master list of available speakers who will share information about their professions.

Career education has become entrenched in the curriculum as material that can supplement social studies units, and can be worked into basic subjects such as language arts. Bailey (1985) has shown how career content can even be provided in basic academic studies.

From another perspective, vocational education has been an active part of the elementary curriculum since John Dewey's pronouncements about "learning by doing." Montessori kindergartens, limited shop courses for the industrial arts and home economics, and activities

encouraged by art specialists--all rely on active participation by the student. The activities may be in making jelly, building a birdhouse, maintaining an aquarium, sewing and remodeling clothes and other projects. It is not inappropriate to consider them as vocational activities. The formalized participative courses may be found more often in the junior high school (seventh and eighth grades) which are a part of our elementary systems.

The microcomputer has revolutionized the classroom in many areas of the United States. Innovative projects, financed by the state or by private enterprise--in addition to the traditional budgeting by school districts--have placed increasing numbers of such equipment in the classroom. While some of the learning activities may be considered "game" playing, the interaction with the computer encourages critical thinking, problem solving, and manual dexterity. This form of career education may encourage students to look towards careers as programmers and systems analysts, but it also provides another tool with which students have become proficient, a worthy objective compatible to vocational education.

Secondary

Vocational education in American secondary schools has often suffered from an elitist attitude that separated college preparatory courses from those in the vocational curriculum. The symbiotic effect of this separation has been felt in other areas as well. Many of these associated problems, however, have occurred because insufficient attention has been paid to quality of course design and delivery.

The system of education in the United States is predicated on the premise of individual differences in achievement potential, career choice, and learning abilities. Consequently, the educational curricula have offered a diverse "cafeteria" of choices for students to meet their individual needs. While this is a worthy goal, studies have unfortunately shown that "Many high school graduates cannot read, write, compute, or perform well enough to find meaningful work during or after school" (National Commission on Secondary Vocational Education, 1985, p. 2). In addition, "an unacceptably high percentage of students (approximately 28 percent) drop out of high school" (National Commission on Secondary Vocational Education, 1985, p. 2).

The initial impetus for much of the vocational education in the high schools was the Smith-Hughes Act. This legislation was based on the premise that students who first worked with concrete objects and experiences would be able to learn abstractions more readily. The "land grant" colleges of the midwest were the main benefactors of the Smith-Hughes Act. As a consequence, many vocational education courses focused on home economics and agriculture.

At the present time more than ten million students, or about two thirds of the high school population, are enrolled in vocational education courses (Foster, 1983). More than 400 different types of vocational education are offered, which can be categorized as: 1) agriculture, 2) distributive education, 3) health, 4) occupational home economics, 5) business and office, 6) technical, 7) trades and industry, and 8) vocational consumer and homemaking (Fryar, 1985). Vocational training is offered in 15,706 public comprehensive or vocational secondary schools, as well as 586 private secondary schools. Similar instruction

is offered at 1,394 public area vocational centers (National Center for Education Statistics, 1983).

Paulter (1985) has cautioned that vocational or proprietary schools operating "for profit" are encroaching on the territory traditionally occupied by secondary vocational education. Commenting on the increase in number of such programs, he observed that "Bell and Howell owns a chain of eleven DeVry schools with an enrollment of 30,000 in the United States, making it the second largest of the proprietary programs. Third is the Indianapolis based ITT Educational Services, Inc." (p. 95). In addition, Paulter (1985) has expressed concern that many vocational educators are unaware of the inroads made by these organizations.

In the 1960s and 1970s most of the funding for vocational education was directed to high schools. Recently, community and junior colleges have been clamoring for a share of the funding on the premise that they are replacing the inadequate vocational programs of many secondary schools. In a sense they have been successful, because they have released monies for more equitable distribution. However, many of the funds that were once discretionary are now designated for special needs students or for equity adjustments by race and sex.

The increasing complexity of high-technology equipment has rendered laboratory or shop courses obsolete in many secondary schools without state-of-the-art facilities. This equipment is often beyond the financial reach of many institutions. To cope with these problems, many school districts have established close liaisons with industry. Such reciprocal arrangements not only help to meet worker needs but also enable some courses to be taught at the industrial site. This practice is not limited to secondary schools, and cooperative agreements

negotiated by community and junior colleges have proven quite satisfactory. Comprehensive universities with associate degree programs, such as those offered by the School of Technical Careers at Southern Illinois University, have also found these arrangements extremely beneficial.

Secondary and postsecondary institutions have become increasingly aware that they often address the same vocational objectives and employ some of the same curricula, resulting in a repetition or duplication of effort. To ameliorate this situation, the "2 plus 2" was developed and has become increasingly popular. This is a program which allows qualified high school students to take courses for credit at local community colleges or universities. Students must have achieved junior or senior status to qualify for this option. The courses may be credited towards graduation from high school as well as applied toward college requirements. In a less formal context, students who have demonstrated specific competencies or skills may receive advanced standing and complete their degree requirements more rapidly than otherwise possible.

Vocational educators are concerned because the 1980s have energized a "back to basics" mentality among many legislators and parents. Much of this concern was stimulated by the report of the National Commission on Excellence in Education, A Nation at Risk (1983). As a consequence, the diversity of course offerings in high schools has been reduced and some universities (including Southern Illinois University) have tightened entrance requirements. Stricter guidelines may be impressed on all students, whether or not they intend to go to college. These guidelines require that students complete four years of English and take more challenging courses in math and science.

Such movements are cyclical, and these rulings may become less rigid within the next decade. At the present time, however, vocational educators have to address the situation and its repercussions. It seems apparent that insisting upon more rigor in the vocational curriculum is more appropriate than eliminating vocational education. Courses should move beyond manual dexterity and operational skills to areas that involve reading, writing, mathematics, communication skills, and problem solving. Lotto (1985) has discussed the Report of the National Commission on Secondary Vocation Education entitled The Unfinished Agenda. This discussion stresses the need for a balanced curriculum that includes both academic and vocational preparation for every student.

Postsecondary

Postsecondary vocational/technical education is offered at a variety of institutions in the United States. While many students attend public, tax-supported community, technical, and junior colleges, other are trained at proprietary schools owned and operated by private individuals or corporations. Generally, the two-year programs award an Associate in Applied Science degree while those requiring up to a year of attendance award a certificate of completion. These programs prepare students for entry-level positions in business and industry, as well as for licensure or certification when credentialing is required.

Historically, secondary programs were the heart of vocational education in the United States. It was at this level that college potential was determined, and students were subsequently directed into either college preparatory programs or vocational tracks to prepare them for jobs. During this time, postsecondary education offering associate

degree and certificate programs was provided by junior colleges. These programs prepared students to continue their education at a four-year college or university. Similar programs were offered by proprietary schools, which prepared students for specific jobs found primarily in business and health fields.

Following World War II, the technological advances of the Sputnik era generated new occupations and expanded existing ones. There was a general consensus that these technological innovations altered occupational demand, leading to a direct shift in vocational education from secondary to postsecondary level. These changes produced a consequent alteration in the focus of junior colleges.

Currently there is substantial agreement that two-year institutions have become predominantly vocational rather than academic (Grubb, 1983). Grubb observed that "postsecondary education is now at the level where the most important developments in vocational education are now taking place" (p. 3). Between 1965 and 1976 the proportion of two-year college students in vocational enrollments increased from 13 to 50 percent (VEDS, 1981). During the 1978-1979 academic year, vocational enrollments in associate degree programs were compared with total community college enrollments. This comparison suggested that up to 72 percent of enrollments were vocational (VEDS 1981). The percentage of community college students enrolled in vocational programs becomes more significant when the overall growth in postsecondary enrollments in considered. Community college enrollments increased by 261 percent in the 1960s and by 90 percent in the 1970s. They continued to increase during the early 1980s, when other enrollments in higher education were remaining constant or beginning to decline (Grubb, 1983).

Supporters of the community college have offered a simple explanation for enrollment growth in postsecondary vocational education: skills for jobs at the middle level, which have grown at a faster rate than other jobs, are most appropriately learned in two-year colleges. These middle-level occupations include a large number of technicians, paraprofessionals, semi-professionals, supervisors, and skilled clerical and craft workers. One description of these middle-level occupations includes the following characteristics:

1. They require training beyond the high school level.
2. They require some theoretical knowledge of mathematics and science equal to the first year or two of a professional program.
3. They require training in the development of manipulative skills for using delicate and precise laboratory instruments and equipment.
4. They often require that a person have personality characteristics which allow him to understand human behavior, especially if he is employed in a supervisory position or in a social service or human-relations occupation.
5. They train students as assistants to professional workers or administrative officials (Monroe, 1972).

The growth and expansion in these occupations has been explained, at least in part, by the dramatic increase in technological developments. This growth is exemplified by the increase in the number of computer-related jobs and those related to various health technologies.

It should be noted that a growing number of universities and liberal arts colleges offer associate degrees which certify the successful completion of various programs obtained in the first two years. In the United States, more than 50,000 associate degrees are awarded annually by institutions other than community, junior, and technical colleges. As early as 1979, the National College Databank reported that

752 universities and four-year colleges were offering associate degree programs (Hegener, 1979). Technical associate-degree programs in universities will be discussed more fully in the next section.

University

Previous reports have discussed the advantages of appropriate articulation and transfer arrangements among high schools, community colleges, and universities in the United States. In addition, this literature has emphasized the need for such arrangements. Unfortunately, documentation on universally accepted or recommended procedures is scarce (Doty, 1985). In fact, there is much support for the development of institutionally specific arrangements designed to meet the needs of the students involved.

Articulation of this type is more readily implemented at the secondary and community college levels. Institutions at both levels are regionally governed, administered, and funded. In addition, the student population is easily identifiable. When universities are considered, however, articulation becomes a more complex issue. Universities have traditionally provided liberal and scientific education as well as professional training. Another difficulty stems from the fact that universities have served a broad geographic area and have been funded either privately or through state agencies.

Nevertheless, the need for articulation to the university level is becoming recognized. Economic conditions dictate the need for technically trained individuals to assume managerial positions, research and development responsibilities, or both. At the same time, universities are facing a decline in enrollment as the number

of those in the high school cohort declines. The two-year technical graduate suits the needs of both constituencies. Universities can provide the additional vocational education needed by industry and students can bolster declining enrollments.

In practice, this articulation is a slow process. Universities are slowly making the transition from their traditional, theoretically oriented approach to the more applied orientation needed by the technical student. This has inadvertently resulted in the development of new course offerings. Most institutions are reluctant to divert resources from traditional areas to address these new thrusts. Consequently, added enrollment must justify the costs of the new offerings or they will not survive.

A few institutions are moving forward successfully in the articulation process. Those who have made the most progress include Ferris State College in Big Rapids, Michigan, and Southern Illinois University in Carbondale, Illinois. Both of these institutions currently have procedures in place for articulation from postsecondary technical institutions. Ferris continually evaluates individual courses offered by in-state community colleges with respect to their transferability. Staff at feeder institutions are then able to advise transferring students so as to maximize their total educational experience. Southern Illinois University is currently using an articulation program with a broader base. The program addresses the technical coursework completed by the student as well as the general education component required by the university. This program is not restricted to those who have attended schools within Illinois, but is available to students who have completed any two-year postsecondary program.

To be eligible for the program, students must have completed a two-year Associate in Applied Science degree with a grade point average of 2.25 on a 4.0 scale. Those wishing to pursue a Bachelor of Science program are guaranteed degree completion within an additional sixty (60) semester hours of coursework. The regular University general education requirement is reduced from 45 to 30 semester hours and the major courses comprise the remainder of the hours needed for the degree. The program is intended to build upon the technical expertise gained prior to university entry. Interest expressed by postsecondary schools, transfer students, and employers of graduates indicates that the program has been very successful.

Of course, the success of the program has been greatly ensured by the staffs of both the postsecondary institutions and those at SIU. Requirements for both eligibility and completion have been presented clearly and steps for admission are followed carefully. The major selected by the transfer student may require that additional assessment be made to determine whether prerequisites for specific courses have been met. With the exception of general education courses, which are evaluated by the University on a uniform basis, no attempt has been made to evaluate classes offered by postsecondary institutions. This is due to the vast number of feeder institutions both in the United States and abroad.

In summary, articulation between postsecondary institutions and universities is evolving slowly. A few universities have accepted advanced technical education as an integral part of their mission and are implementing measures to accommodate the transferring student.

SECTION II: CURRENT ISSUES

The Role of Technical Education in Economic Development

A strong and effective relationship between the education and employment sectors of the economy is vital to the economic health and productivity of the nation. Because education and employment are involved in a two-way, interactive relationship, either sector can serve as a stimulus (initiator) or a response (respondent) in any given situation. Education, in general, is responsive to societal needs. Technical education, in particular, is responsive to the economic factors of a society. A vocational educator at the University of Illinois has stated that, "The role of public vocational education programs is being shaped in response to economic development initiatives, to job training and retraining demands and to technological changes" (Phelps, 1985).

The results of Bleyer's (1982) study on trends in technical education support a positive relationship between educational and economic factors. Bleyer has contended that technical education need not be content with responding to economic trends or being victimized by them. Instead, she has suggested that technical education may be a change agent operating to reverse economic trends.

For example, educational institutions may "gear up" to provide training for jobs in a new industry which has moved into the community. In this context they would be acting in response to a particular economic factor. Conversely, they may lead the way with state-of-the-art programs that develop a highly skilled workforce, providing a stimulus which attracts new industry to the community.

Community colleges and technical institutes have become increasingly aggressive in drumming up new business. Effective strategies include setting up "customized training" for individual firms as well as convincing various semi-professional groups and employers that continuing education and skills-upgrading courses and workshops can be quite valuable.

Technical education in the United States is making its contribution to domestic and international economic development through a number of activities. These include training and retraining programs in addition to consulting services and incubator centers.

Training and Retraining Programs. The purpose of the regular programming described in Section I is to prepare a skilled and professionally credentialed workforce. In addition, training and retraining may be offered through short courses, workshops, or in projects by contract. It may be delivered through traditional classroom/laboratory format or through nontraditional means such as correspondence courses, interactive video, etc. Content and delivery may be tailored to fit the needs of industry, government, or other educational institutions in the United States or abroad.

Consulting Services. Directories of technical educators include areas of expertise and institutional affiliations. These educators frequently offer technical assistance through consulting services. They may contract with industry to train personnel and develop training programs. In addition, educational institutions may find their services valuable in developing curricula, planning facilities, and training staff.

Incubator Centers. Incubator centers are sheltered environments for fledgling businesses and industries in an educational setting. By providing technical assistance and support services, the educational institution can reduce some of the financial risk in entreprenurial ventures. Peter McPherson (1983), Administrator of the Agency for International Development (AID), has observed that 80 percent of new employment in the United States springs from neophyte firms employing 20 people or less. McPherson also noted that even a small enterprise involving the creation of five jobs has an impact on economic development.

The Governor of Illinois emphasized the significant relationship between education and economic development when he stated that "The single most important issue to affect job location in the next decade...is education--its availability, its diversity, and its quality" (Wagner, 1985).

Appropriate Role of Technical Education In United States Higher Education

The impact of America's transformation into a technological, information-based society is being felt at all educational levels. Elementary and secondary schools are being charged with the responsibility for teaching the basic communication skills. Technical education must then be addressed at the postsecondary level. Increasingly sophisticated training for technical competence is provided at community colleges, proprietary schools, and technical institutes.

Since it has been established that technical education has a direct impact on both domestic and international economic development, it seems

appropriate to examine its role within higher education in the United States. The configuration of career fields within this technological society indicates that higher education is playing an increasingly vital role. Technological advances are creating the need for tiers of employees. While some of these employees need higher, more sophisticated levels of formal education, others require lower, less complex levels of training due to the mechanization of tasks. Those in the upper tiers need the tools and facilities to adapt in a complex and rapidly changing technological environment. They also require communication skills necessary for assumption of leadership roles and cooperative effort as a member of a team involving professional, technical, and support personnel. These are the individuals best served by higher education and, conversely, those who need services available only in that setting (Miller, 1984).

The curricular needs of technical education are extensive and diverse. They include basic theories of technology and applied technical skills, as well as general education, communication skills, science, mathematics, social science, and humanities. The National Commission on Excellence in Education (1983) has observed that "Knowledge of humanities must be harnessed to science and technology if the latter are to remain creative and humane, just as humanities need to be informed by science and technology if they are to remain relevant to the human condition" (p.3).

Traditionally, all except the applied technical skills have been a part of the role and mission of higher education institutions. Such institutions have always addressed technical fields from the professional engineering perspective, emphasizing theory rather than application. Since the arrival of the technological era, American higher

education has been more willing to consider inclusion of applied technical training in the curricular offerings. Many, in fact, have already begun to offer such training. However, such programs are carefully scrutinized as resources become more scarce. They may be diminished or eliminated on the premise that technical training is the primary goal of community colleges and technical institutes.

Even if that argument is accepted, higher education does function to fulfill educational needs in areas outside of the technical realm. That fact provides a strong argument in favor of the 2 plus 2 articulation. In this sequence, the community college or technical institute provides the applied technical skills and the university offers general education in addition to coursework in the theoretical basis of technology. Articulation may be accomplished whenever an individual feels a need to expand or extend expertise through formal university coursework. This might involve completion of an undergraduate degree, participation in less formal continuing education workshops, lectures, or seminars, or both of these options.

Increased Requirements of Competency Levels

Technical education in the United States is being impacted by several factors. Among these is the upward spiral in accreditation, certification, and licensure requirements. In some cases, the increase in requirements is a result of expanding knowledge and technology in a specific field. It may also represent a sincere effort to ensure quality among practitioners. However, there are instances where expanded requirements simply seem to reflect the increasing availability of education.

New requirements are being implemented by a number of professional fields. The National Council of Architectural Registration Boards (NCARB) established a new educational standard in July 1984. The new policy requires that those seeking NCARB registration must hold a professional degree from an accredited, five-year architectural program. Heretofore, those with either two-year or four-year degrees and appropriate professional experience were eligible to take the examination for NCARB registration. Several states in the United States have also expanded the examination for licensure of dental hygienists to include anesthesiology. The additional subject matter requires at least an additional semester of training.

While program accrediting agencies and professional certification associations have increased requirements, employers are now demanding higher degrees and more sophisticated competencies. In 1985, recruiters from American Telephone and Telegraph (AT&T) who were visiting Southern Illinois University requested to interview only four-year and graduate degree recipients. This was the first time such a request had been made.

The increase in requirements is having a serious impact on technical and professional programs. It has sparked a debate among educators advocating upgrading of skills and those concerned with downgrading occupations into simpler components. There is also concern about the effect of this controversy on the structure and function of education in relation to the world of work (Spenner, 1985). In one respect, technical programs are tending to expand to accommodate the accrediting bodies, licensure/certification associations, and prospective employers. In another, there is evidence of underemployment

and overeducation among the workforce. Research shows that schooling and training may have more to do with getting jobs and launching careers than with eventual performance in work roles (Clogg & Shockey, 1984; Berg, Bibb, Finegan, & Swafford, 1981). This issue is not resolved and the debate continues.

Funding the Increased Costs

The funding sources for technical education are diverse, given the wide range of schools that offer vocational courses: public and private comprehensive universities, community and junior colleges, technical institutes and regional vocational centers, and "for profit" proprietary schools. Support from private foundations has not been a reliable source for the maintenance of continuing programs, although innovative programs may receive initial appropriations of varying amounts. A review of governmental funding revealed that states outmatch federal investment in vocational education by roughly nine state dollars for every federal dollar (Lotto, 1985). However, many of the state dollars are channeled to the states from federal sources.

In addition to providing financial support, the Educational Amendments of 1976 (P.L. 94-482) mandated that the U.S. Office of Education conduct a review of all the states' programs. Groups recommended for this process are those with specific evaluative responsibilities such as state boards, state advisory councils for vocational education, and the National Advisory Council for Vocational Education. Organizations such as the Bureau of Occupational and Adult Education, the National Institute of Education, and the National Center for Educational Statistics in Vocational Data Systems were also suggested.

For the last fourteen years the competitive funding available from the Fund for Improvement of Post-Secondary Education (FIPSE) has been overwhelmingly popular. This fund was created to provide "seed money" for diverse projects designed to reform teaching and learning methods in postsecondary institutions. Considered innovative because it does not dictate what kinds of proposals it funds, it stands alone as a wide-open program that gives support to innovation (Palmer, 1985).

The Gramm-Rudman-Hollings Bill, designed to decrease massive federal deficits, is a threat to FIPSE and other key sources of funding. University administrators anticipate at least a four to five percent cut in the funding provided to the Department of Education in 1986. Such cuts will affect research funds as well as those designated for student aid in the form of work-study programs and guaranteed student loans (Higher Education Daily, Jan. 13, 1986).

Faculty and administrators have been proposing a careful assessment of the entire system used to finance higher education. It has also been suggested that we consider a large-scale system of indirect federal financing that comes from expanding and federalizing the "Yale Plan" or the "Pay As You Earn" (PAYE) plan proposed by former Governor John J. Gilligan of Ohio. With PAYE, state and federal money for public higher education would be used mostly for capital expenditures, research, and public service. Students would pay the actual cost of a college education financed by loans defrayed by a surtax on federal income taxes (Erlich, 1985).

Other administrators are examining cost-effective methods of utilizing resources and equipment such as classrooms and microcomputers. Expenditures can also be reduced through the use of on-site, state-of-

the-art equipment in cooperative ventures with industry, and by considering the cost of maintaining equipment as well as the initial purchase price. Expensive laboratories, often used only several hours a day, need to be made available for uses other than instruction for single classes or programs. This may help reduce short-sighted, possessive behaviors and enable programs and departments to function more efficiently. The real challenge to vocational education in the 1980s is the development of innovative programs to welcome emerging technologies and the maintenance of existing programs in financial straits.

SECTION III: INNOVATIONS AND RECOMMENDATIONS

The last section of this paper briefly describes some of the innovations that have enhanced the quality of technical education in the United States, and contributed to its success in meeting the need for a highly skilled workforce in a technological society.

Advisory Committees

The role of advisory committees for vocational/technical programs has increased in importance during the last decade, which has been a period of increasingly sophisticated technological change. Effective advisory committees are comprised of representatives from appropriate business, industry, exemplary educational programs, and government agencies. They meet formally at least once a year to review relevant program data, evaluate program outcomes, and plan directions for future programming. However, they are available for informal interaction with administrators, faculty, and students on an ongoing basis, if needed.

Their contributions, while diverse and sometimes unique, tend to fall into the following categories:

1. curriculum recommendations
2. professional development opportunities for faculty
3. internship and cooperative education experiences for students
4. placement opportunities for graduates
5. arrangements for equipment donations
6. arrangements for corporate scholarship awards
7. presentations to students as guest lecturers and representatives of business/industry

Developing Industrial/University Linkages

At no time in the history of education have cooperative arrangements with industry seemed more imperative. American education is faced

with limited funding and funding sources, the need for program accountability, and an increasing demand to meet the needs of diverse constituencies wanting saleable skills. At the same time, both private and government employers are in need of highly motivated, skilled employees. This is especially true in the fields involving high technology (Clark, 1984).

Establishment of these linkages has potential value for all involved constituencies. To assure positive outcomes for all concerned, the process employed to arrange linkages should address the following concepts:

1. Cooperative planning to include development of joint goals and objectives and identification of needed resources;
2. Curriculum evaluation and revision as an on-going process;
3. Staff development in both the academic and vocational areas;
4. Instructional materials and equipment, especially those available through the sponsoring industry/government agency for instructional use; and
5. Cooperative educational management applying business strategies to the educational setting (Clark, 1984).

Linkages may take a variety of forms. The more formal may lead to a specific degree. Others may be short-term workshops designed to upgrade skills of individuals already employed in a specific field, or faculty development experiences to update technical skills on newly acquired equipment. These examples are not all inclusive, and many other types of linkages exist.

In the United States, many institutions of higher education have participated in work-study or cooperative programs leading to the

granting of undergraduate degrees. For the past six years, the School of Technical Careers of Southern Illinois University has participated in cooperative programs (co-ops) with government and industry involving students who have completed all or part of their technical training and are seeking either a two-year associate or a four-year baccalaureate degree. The experiences have involved alternating periods of employment and education. Since the first formal arrangement with the Oldsmobile Division of General Motors Corporation six years ago, several organizations have contacted the STC to arrange co-ops. In some cases this has led to formal agreements (such as that with the Federal Aviation Administration for Air Traffic Controllers). In other situations less formal arrangements were suitable.

The co-ops have proven to be advantageous to all involved. The corporation or agency has the opportunity to review the job performance of a potential permanent employee and to promote a positive image of itself in the University community. Students receive "hands-on" training and experience in the chosen career as well as the opportunity to integrate educational and employment experiences while earning wages. The University and, more specifically, the program directly involved, gains an ally and proponent in the work world. This ally is likely to employ other students as well as the co-op student, to offer scholarships and donations of equipment to enhance training, and to provide consulting services, in-service opportunities, or both to staff members. Ultimately, the program as well as the University is strengthened through the continuous enhancement of the curriculum.

In order to assure the above, establishment and implementation of the co-op must address the following:

1. Criteria and procedures for selection of students,
2. Integration and scheduling of work periods with education periods,
3. Integration of educational curriculum with work activities.
4. Evaluation of students while in work periods with respect to continuation in co-op programs, and
5. Nature of commitment on the part of the student, the corporation/agency, and the university following completion of the educational program/degree.

Use of Part-time Adjuncts/Specialists

Many institutions have started to assess long-range repercussions involved in granting faculty members tenure for life, based on teaching performance after a given trial period. This is being done for both financial and pedagogical reasons. As a result, a number of institutions have started hiring faculty to whom their commitment is minimal. Employment is ordinarily semester-by-semester, or as dictated by given course needs. And part-time instructors sometimes are thus hired close to the beginning of the semester or quarter. Such faculty may include those who have had difficulty obtaining full-time employment, such as new Ph.Ds from crowded fields. These positions may also be obtained by individuals who are employed full-time in other capacities or those who are attracted to the decreased responsibilities involved in part-time employment.

Faculty who are also employed in other fields bring the reality of the workplace to campus, often from responsible positions such as hospital administrators, airport managers, and small business owners. Their expertise brings a "breath of fresh air" to the sometimes stale

environment of academe. However, these adjuncts also bring along special needs and potential problems.

Many of the adjuncts have little or no teaching experience. Although they may be enthusiastic about their new or additional positions as faculty members, they often need the support of workshops or other forms of in-service training to ensure that the quality of their teaching approaches that of other faculty. A funded project of Vista College in Berkeley, California, addressed the need to deal with the detachment of part-time faculty from the institution. Workshops and preparation of audio-visual materials dealt with teaching issues and encouraged faculty identity (Elioff, 1980).

Administrators examining the dramatic growth of adjunct faculty in the last decade need to be aware that "adhocracy is one danger; exploitation may be another" (Brown, 1982, p. 3). Brown has also suggested that administrators should review alternative methods of instruction before hiring adjuncts. Suggested methods include using full-time faculty more effectively and investigating uses of educational technology. Adjuncts may lack academic credentials and commitment, as well as knowledge related to the philosophy and procedures of the institution.

Stafford (1981) conducted a survey of in-service training needs for part-time teachers who taught courses for adult basic education students. Results indicated that their highest needs concerned practical ways to motivate ABE students, methods of raising students' self-concept, and knowledge about school and community resources for referral. These problems should also be among the concerns addressed by regular faculty.

An additional study (Vitello, NewMyer, & Stivers, 1985) compared the quality of teaching by regular faculty with that of adjuncts. Both groups taught off-campus courses presented on military bases. Instructional evaluation forms completed by students indicated that classroom experiences differed slightly. On a five-point scale (outstanding=5, strong=4), adjuncts were rated 4.29 and regular faculty were rated 4.48. Items receiving the highest ratings for each group varied. It was concluded that part-time faculty would profit from workshops offered by SIU in different regions of the country at locations accessible to the greater number of adjuncts. To date, one has been offered in the South (Florida) and another in the West Coast (California).

Part-time faculty can facilitate the development of innovative courses which may eventually become new programs. In addition, these specialists can be a valuable addition to the educational experience of the students on- and off-campus. However, the difficulties involved in training and integrating them into the academic milieu are issues that must be dealt with.

Innovative Delivery of Courses

During the 1970s there was a dramatic increase in the diversity of courses offered to students. The number of locations at which these courses were offered also increased dramatically. Military bases have welcomed courses and complete programs. Others have been offered in shopping malls and in countries other than that of the host institution. Students have the option of learning through high technology involvement such as cable television or through independent study courses which use course guides and audio-visual supplements.

Such diversity was accompanied by concerns about quality control of courses and questions about the academic integrity of such programs. In adopting guidelines, the Missouri Coordinating Board for Higher Education contended that off-campus activities should evolve from programmatic strengths of on-campus programs and academic expertise of the institution (Lynd, 1981). This insistence was a response to accusations by Bailey (1979) who warned against the "historic reality of academic uneveness" and declared that "surely there are way stations between snobbery and slobbery" (p. v). Bailey called for assurances of regular and frequent contact between campus-based faculty and administrators and off-campus representatives.

NewMyer and Vitello (1983) described the types of regulation faced by schools offering off-campus programs outside their "home" state of operation. This regulation was primarily concerned with the Department of Defense directive, and regulations from the national Veterans Administration and individual states. Hertz (1979) has discussed special planning needs for such courses and demonstrated how existing courses could be adapted by the new breed of teachers (Hertz, 1978).

The potential for reaching large groups of students through the use of television is apparent. However, planners in this area must also be cognizant of problems involved in the assessment of learning and the development of ways for credentialing the learning experience. Some critics note that such offerings might well detract from enrollments at the host institution. This assertion was refuted by a telephone survey of 536 enrollees in the State University of Nebraska (SUN). This institution is part of the University of Mid-America, a distance education

consortium comprised of eleven universities in seven midwestern states. Brown (1982) reported that over 33 percent did enroll at the University within a few years of their SUN enrollment.

Thornton & Green (1985-1986) have projected that recent federal legislation may have a negative effect on the availability of educational access to cable television. The authors contend that the PBS Adult Learning service has a monopolistic approach toward licensing and distribution of many of the most popular telecourses. This has prompted some administrators, especially community college leaders, to rethink arrangements.

Such innovation in packaging and in delivery offers many potential rewards, but also carries potential for abuse. Decision makers should proceed with caution, and with attention to the integrity and rigor of the institutional offerings.

Conclusion

Technical education in the United States is a diverse and exciting field with tremendous potential for growth and expansion. Innovative procedures and techniques are being devised to keep pace with the exponential rate of technological change, and some degree of technical education is offered in nearly all school curricula. Because today's society is becoming increasingly dependent on technological innovations, these developments show great promise for students as well as educators involved with technical training programs.

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